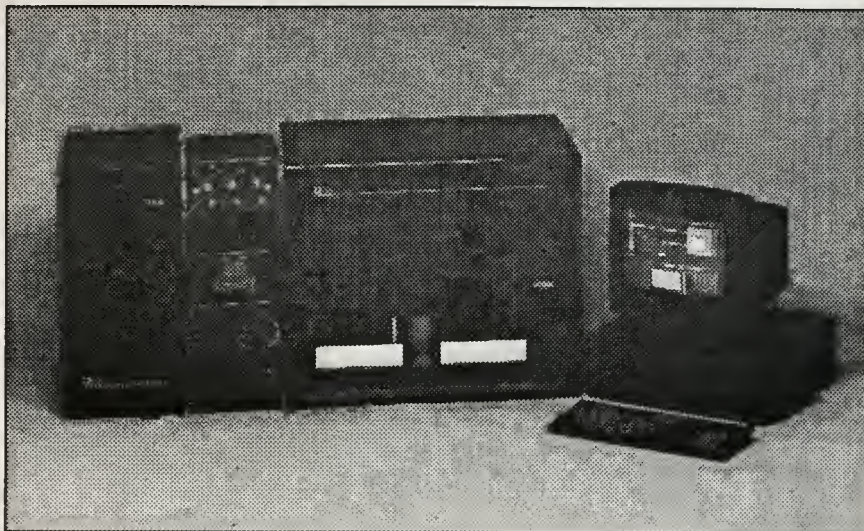


On-line Microwave Digestion

"Questron has specialized in supplying microwave digestion equipment to laboratories. The development of automated digestion is a logical progression from the manual open and closed vessel systems previously offered by Questron. With our ongoing development group in Ontario, our automation solutions will continue to expand in the near future. Questron's application laboratory, under Dr. Sergey Leiken, supports ongoing sales of the Q5000 automated microwave digestion system."

Paul Burgener
Vice President
Questron Canada Inc.
Mississauga, Ontario



Automated Microwave Digestion System.

THE COMPANY

Questron is a market leader in Microwave Chemistry. Founded in 1984, it was selected as one of the Top Ten Upcoming Businesses in New Jersey for 1994. The Questron product line includes systems for: Microwave Digestion, Extraction and Synthesis, Automated Sample Preparation, Mercury Analysis, both for elemental and speciation. Marketing and sales are conducted throughout the world by Questron and a network of 24 technical distributors.

In 1992 Questron began a cooperative study with the Florida Department of Citrus (FDOC). Questron now shares a patent with FDOC and has rights to manufacture and market continuous flow microwave pasteurization systems world wide. Questron continues to investigate the use of Microwave Technology for sterilization, remediation, analysis, waste water treatment and other areas for which microwaves would produce technical and economic benefits.

THE CHALLENGE

The increasing demands on analysts to report more parameters through the use of ICP's AND ICP-

MS's at reduced costs has created an imbalance in the labour intensive sample digestion stages of analysis versus the rapid multielement capability of detection instruments. The advent of microwave digestion in both open and closed vessels, had shortened digestion times and often improved extractions. Unfortunately, the advances brought about by the use of these new techniques was not fully utilized as substantial time was required to load, unload, clean, and monitor samples. Batch digestions made use of a single control vessel leaving some uncertainty in conditions actually achieved in unmonitored vessels. This could, at times, cause problems in legal defence of unmonitored samples.

TECHNOLOGY DESCRIPTION

Research carried out under Dr. Salin at the University of McGill indicated that standard microwave digestions could be carried out in small tubes. The research showed that sample decomposition was equivalent to large diameter vessel digestions. The use of small diameter digestion tubes has allowed sample introduction, recovery, and cleaning to be demonstrated under this project.

RESULTS

A robotic workstation has been developed which allows dry powders or liquids to be placed in test tubes.

The workstation then adds reagents, and washes the mixture into the microwave for digestion under high pressure and temperature. On completion of the digestion, air transports the cooled digestate to a new test tube for collection. The system then self cleans and progresses to the next sample. The Q5000 follows classical chemical procedures and uses concentrated or dilute acids as appropriate for a given protocol. The temperature and pressure are recorded several times a second and plotted for an analyst as the digestion progresses. The graphs are stored for each sample and can be utilized later to verify digestion conditions for each sample.

TECHNOLOGY OPPORTUNITIES

The Q5000 automated digestion system is being sold to companies carrying out digestions of soils, crushed rock, vegetation, and radioactive materials, using concentrated or strong acids. Total dissolution of silicate materials is possible with the use of hydrofluoric acid. The automated

addition of such acids provides a high degree of safety to the analyst. The integrated fume containment hood allows easy utilization in any laboratory area. The design is also being extended into general chemistry workstation automation.

PARTNERSHIP IN POLLUTION PREVENTION AND RESOURCE CONSERVATION

The demonstration of this technology was partially funded by the Ontario Ministry of Environment and Energy.

Industrial companies located in Ontario may seek ministry services which will help them:

- * reduce, reuse and recycle solid waste;
- * effectively remediate historic pollution and destroy hazardous contaminants;
- * reduce or eliminate liquid effluent and gaseous emissions;
- * use energy and water more efficiently.

Equipment and services supply companies can benefit from the information provided on technologies identified for business development.

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MINISTRY OF ENVIRONMENT AND ENERGY SERVICES

For information on Ministry of Environment and Energy assistance to industry, please contact the Industry Conservation Branch at
(416) 327-1492, Fax (416) 327-1261

This project profile was prepared and published as a public service by the Ontario Ministry of Environment and Energy. Its purpose is to transfer information to Ontario companies about new environmental technologies.

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